



IB MYP YEAR 5  
ASSESSMENT TASK  
**A Broad-based Test**

Subject:	Y9 <i>Standard</i> Mathematics	Name : (Class)	<i>Michael Budihardjo</i> ( ) <i>Y9 Trust</i>
Assessment:	Broad-based Test		
Date of assessment:	8 <sup>th</sup> June, 2012		

- This task assesses Criteria A and C;
- Time allowed – *1 hour and 30 mins*;
- You must answer all the questions;
- Write your answers in the spaces provided;
- Show all of your working – not just the answer
- Scientific Calculator is allowed.

Criterion A		
Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	Students are reasonably successful with the Part A questions only. Any errors here are relatively minor.	The student <b>generally</b> makes appropriate deductions when solving <b>simple</b> problems in <b>familiar</b> contexts.
3-4	Students are successful with Part A questions. The only errors in part B questions are minor.	The student generally makes appropriate deductions when solving <b>more complex</b> problems in <b>familiar</b> contexts.
5-6	Students are successful with Part A and B questions. The only errors in part C questions are minor.	The student <b>generally</b> makes appropriate deductions when solving <b>challenging</b> problems in a <b>variety</b> of <b>familiar</b> contexts.
7-8	Students are successful with Part A, B and C questions. The only errors in part D questions are minor.	The student <b>consistently</b> makes appropriate deductions when solving <b>challenging</b> problems in a <b>variety</b> of contexts including <b>unfamiliar situations</b> .

Criterion C		
Levels	Task-Specific Rubric	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	Very little working is shown, and/or the steps shown are confusing. Only the most basic mathematical symbols are used with accuracy.	The student shows <b>basic use</b> of mathematical language and/or forms of mathematical representation. The lines of reasoning are <b>difficult to follow</b> .
3-4	The working shown is generally adequate. Only a few errors in symbols/terminology are evident. It is reasonably easy to follow a student's logic/reasoning.	The student shows <b>sufficient use</b> of mathematical language and forms of mathematical representation. The lines of reasoning are <b>clear though not always logical or complete</b> . The student moves between different forms of representation with <b>some success</b> .
5-6	There are very few, if any, errors in symbols/terminology. All steps in calculations are shown in their completeness. It is easy to follow all the student's logic/reasoning.	The student shows <b>good use</b> of mathematical language and forms of mathematical representation. The lines of reasoning are <b>concise, logical and complete</b> . The student moves <b>effectively</b> between different forms of representation.

Part A (Level 1-2 Questions)

1. Factorize the following

a.  $x^2 - 16x$

$$x^2 - 4x^2$$

$$= (x + 4x)(x - 4x)$$

Answer

(a)

~~$(x + 4x)(x - 4x)$~~

b.  $x^2 - 16$

$$x^2 - 4^2$$

$$= (x + 4)(x - 4)$$

Answer

(b)

~~$(x + 4)(x - 4)$~~

c.  $x^2 + 3x - 28$

$$\begin{array}{r} x \quad 7 \\ \times \quad -4 \\ \hline 7x - (-4x) = 3x \end{array}$$

Answer

(c)

~~$(x + 7)(x - 4)$~~

2. Consider a set of data 11cm, 15cm, 19cm, 8cm, 9cm, 12cm, 13cm, 15cm, 17cm and 12cm.

a. Find the mean of this set of data.

$$\frac{11 + 15 + 19 + 8 + 9 + 12 + 13 + 15 + 17 + 12}{10}$$

Answer

(a)

~~$13.1$~~

b. Find the median of this set of data.

$$\frac{9 + 12}{2} = 10.5$$

Answer

(b)

$10.5 \text{ cm}$

c. Find the mode of this set of data.

Answer

(c)

~~$15 \text{ cm}$~~  , ?

**Part B (Level 3-4 Questions)**

3. In Ivan's family, there are 8 members, including Ivan himself, his father, mother, grandmother, 2 elder brothers, 1 elder sister and 1 younger sister. If a person is chosen at random, find the probabilities of the following events happening.

a. Ivan's elder brother is chosen.

$$P(E) = \frac{2}{8} = \frac{1}{4}$$

Answer

(a)

$$\frac{1}{4}$$

b. A male is chosen.

$$P(E) = \frac{4}{8} = \frac{1}{2}$$

Answer

(b)

$$\frac{1}{2}$$

4.

$$\cos^2 \theta - \sin^2 \theta = 2\cos^2 \theta - 1$$

a. Show that  $\cos^2 x - \sin^2 x = 2\cos^2 x - 1$

$$\cos^2 x - \sin^2 x = 2\cos^2 x - 1$$

$$\therefore \text{L.H.S.} = \text{R.H.S.}$$

$$1 - \sin^2 x = 2\cos^2 x - \cos^2 x$$

$$\Rightarrow 1 - \sin^2 x = \cos^2 x$$

$$\Rightarrow \cos^2 x = \cos^2 x$$

Answer

(a)

$$.....$$

b. If  $\cos \theta = \frac{1}{5}$ , find the value of  $\cos^2 x - \sin^2 x$

From a)

$$\cos^2 x - \sin^2 x = \cos^2 x$$

$$\therefore \cos^2 x = \cos^2 \left( \frac{1}{5} \right)$$

$$= \frac{\cos^2 x}{5}$$

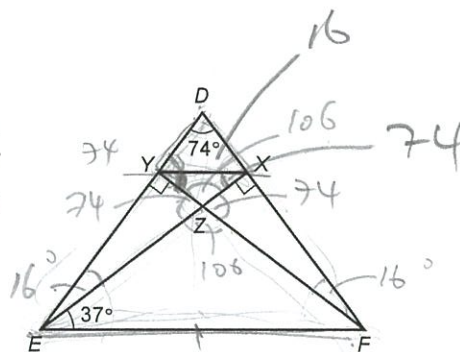
Answer

(b)

$$\frac{\cos^2}{5}$$

Part C (Level 5-6 Questions)

5. In the figure,  $DYE$  and  $DXF$  are straight lines.  $EX$  and  $FY$  are the altitudes of  $\triangle DEF$  on  $DF$  and  $DE$  respectively, and they intersect at  $Z$ .  $\angle EDF = 74^\circ$  and  $\angle XEF = 37^\circ$ .



- a. Prove that  $\triangle DEF$  and  $\triangle ZEF$  are isosceles triangles.

In  $\triangle DEX$

$$180 - (\angle EDX + \angle DXE) = 180 - 74 - 90 = 16^\circ \text{ (L sum of } \triangle)$$

In  $\triangle DYF$

$$180 - (\angle YDF + \angle DYF) = 180 - 74 - 90 = 16^\circ \text{ (L sum of } \triangle)$$

In  $\triangle YZE$

$$180 - (\angle YEZ + \angle ZYE) = 180 - 16 - 90 = 74^\circ \text{ (L sum of } \triangle)$$

$$\therefore \angle YZE = 74^\circ$$

$$\angle XZF = 74^\circ \text{ (vert. opp. } \angle s)$$

- b. Prove that  $EF \parallel YX$ .

$DYE$  and  $DXF$  are straight lines

$$\frac{DY}{YE} = \frac{DX}{XF}$$

$$\frac{\angle YDX}{\angle EZF} = \frac{74}{106} = \frac{37}{53}$$

$$\triangle DYX \sim \triangle EZF \text{ (2 sides ratio inc. } \angle)$$

$$\therefore \angle DYX = \angle DEF = 53^\circ \text{ (corr. } \angle s \sim \triangle)$$

$$\angle DYX = \angle DEF \text{ (corr. } \angle s \text{ eq. } \triangle)$$

$$\therefore EF \parallel YX$$

$$360 - 74 - 74 = 212^\circ \text{ (Ls at a pt.)}$$

$$\angle EZF = 212^\circ \div 2 = 106^\circ$$

In  $\triangle EZF$

$$180 - 106 - 37 = 37^\circ \text{ (L sum of } \triangle)$$

$$= 37^\circ \text{ (L sum of } \triangle)$$

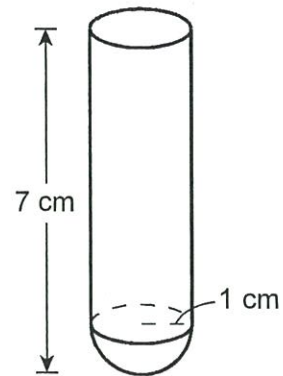
$$\angle DEF = \angle DFE = 53^\circ \text{ (opp. } \angle s \text{ eq. } \triangle)$$

$$\angle ZEF = \angle ZFE = 37^\circ \text{ (opp. } \angle s \text{ eq. } \triangle)$$

$\therefore \triangle DEF$  and  $\triangle ZEF$  are isos.  $\triangle s$



6. The figure shows a solid composed of a right cylinder and a hemisphere. The height of the solid is 7 cm and the base radius of the cylinder is 1 cm.



- a. Find the volume of the solid.

(Express your answers in terms of  $\pi$ .)

$$\begin{aligned}
 & 2\pi(1)(7) + \frac{2}{3}\pi(1)^3 \\
 & = 14\pi + \frac{2}{3}\pi \\
 & = \frac{44}{3}\pi
 \end{aligned}$$

Answer

(a)

$$\frac{44}{3}\pi \text{ cm}^3$$

- b. Find the total surface area of the solid.

(Express your answers in terms of  $\pi$ .)

$$\begin{aligned}
 & \pi(1)^2(7) + \pi(1)^2 + 2\pi(1)^2 \\
 & = 7\pi + \pi + 2\pi \\
 & = 10\pi
 \end{aligned}$$

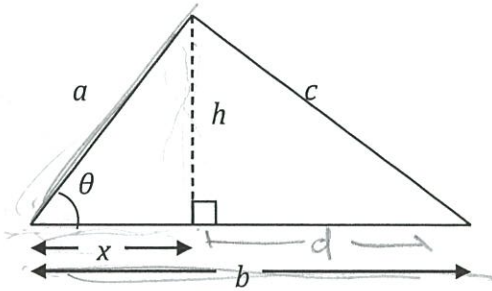
Answer

(b)

$$10\pi \text{ cm}^2$$

Part D (Level 7-8 Questions)

7. Given a triangle:



For questions a – d, write equations that:

a. relates:  $a$ ,  $h$ , and  $x$

Answer (a)

$$a^2 = h^2 + x^2$$

b. relates:  $x$ ,  $a$  and  $\theta$

Answer (b)

$$\cos \theta = \frac{x}{a}$$

c. expresses  $c^2$  in terms of  $x$ ,  $b$  and  $h$

Answer (c)

$$c^2 = (b-x)^2 + h^2$$

d. Using equations above, show that  $c^2 = a^2 + b^2 - 2ab \cos \theta$

$$c^2 = a^2 + b^2 - 2ab \cos \theta$$

$$\Rightarrow c^2 = a^2 - 2ab \cos \theta + b^2$$

$$\Rightarrow \sqrt{(b-x)^2 + h^2} = \sqrt{h^2 + x^2} - 2ab\left(\frac{x}{a}\right) + b^2$$

8. Given the points A(2,R), B (1,1) and C (4,3)

a. Find the distance between B and C

$$BC^2 = \sqrt{(1-2)^2 + (1-R)^2}$$

$$= \sqrt{1 + (1-R)^2}$$

Answer (a)

$$\sqrt{1 + (1-R)^2} \text{ cm}$$

b. Find the equation of the line passing through B and C

$$\left(\frac{1+4}{2}\right) \cdot \left(\frac{3+1}{2}\right)$$

$$= \frac{5}{2} \cdot \frac{4}{2}$$

$$= \frac{5}{2} \cdot 2$$

Answer (b)

c. If the line AC is  $\perp$  to BC, find the value of R

$$m_{AC} \times m_{BC} = -1$$

$$\Rightarrow \left(\frac{3-R}{4-2}\right) \times \left(\frac{3-1}{4-1}\right) = -1$$

$$\Rightarrow \left(\frac{3-R}{2}\right) \left(\frac{2}{3}\right) = -1$$

$$\Rightarrow \frac{6-2R}{6} = -1$$

$$\Rightarrow 6-2R = -6$$

$$\Rightarrow -2R = -12$$

$$\Rightarrow R = 6$$

Answer (c)

6

d. Find the  $\angle ABC$

From a)  $BC = \sqrt{1 + (1-6)^2}$

$$= \sqrt{1 + 25}$$

$$= \sqrt{26} \text{ cm}$$

$$\angle ABC = \tan \theta = \frac{\sqrt{13}}{\sqrt{26}}$$

$$\angle ABC = 57.9^\circ \text{ (3 sig fig)}$$

Answer (d)

57.9

--The End of Paper---

$$AC^2 = \sqrt{(3-6)^2 + (4-2)^2}$$

$$= \sqrt{9 + 4}$$

$$= \sqrt{13}$$

$$AC = \sqrt{13} \text{ cm}$$